RESEARCH PAPER

Dose-Response Effects of Upper-Body Blood Flow Restriction Training on Grip Strength and Manual Dexterity in Patients with Median Nerve Impingement: An Experimental Pilot Study

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Abstract
Background: Blood flow restriction (BFR) training can be undertaken in conjunction with low-load resistance training. Due to a lack of research regarding pressure-response for upper-extremity rehabilitation, this research aims to understand the dose-response effects of BFR in adults with mild-to-moderate median-nerve impingement and the effects on grip strength and hand dexterity. This paper presents a simulated pilot dataset and is based on research conducted on 36 adults, separated in groups of 12 based on 30%, 50%, and 70% of an individualized specified limit for limb occlusion pressure (LOP). The modeled intervention consisted of low-load training of the hands and hands for a total of 18 training sessions spread over a time period of 6 weeks. Strength testing of the hand and the Nine-Hole-Peg test (NHPT) was performed pre- and post- intervention. Statistical analysis was performed with paired t test, a two-way mixed ANOVA, and Holm-adjusted post hoc, correlation, and regression. The findings from this research showed that grip strength improved for the 30%, 50%, and 70% LOP training groups by 1.00 kg, 2.19 kg, and 3.48 kg, respectively. The average NHPT improvement was 0.80, 1.61, and 2.39 seconds for the 30%, 50%, and 70% LOP training groups, respectively. There was a significant interaction effect among groups in regards to grip strength ($F(2,33)=18.21$, $p<.001$, t2=0.525) and NHPT ($F(2,33)=13.43$, $p<0.001$, t2=0.449). The simulated data in this research shows that a BFR with a graded response is possible, but no clinical evidence exists. In order to determine a safe response with a graded BFR for median-nerve impingement, a randomized clinical trial needs to be conducted.

Keywords: blood flow restriction training; median nerve impingement; grip strength; manual dexterity; limb occlusion pressure; Nine-Hole Peg Test; rehabilitation
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1. INTRODUCTION

This condition impedes hand functionality through the weakening of grip strength, the loss of sensation and fine motor control. The most common example of this condition is Carpal Tunnel Syndrome (CTS). This syndrome occurs when the Median nerve is compressed at the wrist as it passes into the hand. A typical conservative treatment plan consists of wrist splinting, therapeutic exercise, nerve and tendon gliding, use of physical modalities, and if all else fails, surgery. Although various clinical studies and reviews suggest that there is improvement in the symptoms and function of the hand, the treatments show a high level of variability and there is currently no exercise that has proven to be effective in every scenario (Anbody citations). Thus, muscular capacity at low mechanical loads is a treatment option that may be beneficial under this specific context.

Blood Flow Restriction (BFR) is a treatment that combines low mechanical loads and the restriction of blood flow to a localized area of the body due to external pressure, in this case, the arm. Although there is a high level of variability regarding the efficacy of BFR, the combination of mechanical load and the restriction of venous blood flow can have a highly beneficial effect for the enhancement of muscular and also nervous capacity (Citations).

The appropriate dose of blood flow restriction (BFR) therapy is a personal prescription. For example, limb measurements and blood pressure may influence the pressure prescribed for blood flow occlusion. Studies have shown that a prescription that includes a range (for example, a percentage of limb occlusion pressure) appears to be a rational method for administering BFR. Requiring a range of pressures appears to be a more effective prescription. The current simulated pilot imposes a 30%, 50%, and 70% permit pressure range and is designed to evaluate pre- and post-therapy, as well as post- therapy, for the interaction of time, dose, and a linear dose-response for strength and performance of the Nine Hole Peg Test (NHPT).

2. MATERIALS AND METHODS

2.1 Study Design

36 adults were simulated and assigned to one of three groups that corresponded to the 30%, 50%, and 70% of individualized limb occlusion pressure (LOP) groups. A six week program was simulated, and the subject completed three of the eighteen BFR sessions. The pressure-response groups were selected based upon the rationale of prescribing a limited pressure-response. The model also did not suggest that 70% was the optimal pressure for treating median-nerve compression.

2.2 Participants

A simulated cohort of adults (age range 25-60) that were assumed to have clinically stable yet symptomatic, mild-to-moderate median nerve compression: Participants were of both sexes, occurred in both dominant and non-dominant hands, and balances out symptoms of compression of both short and long duration. Groups were created to be comparable in pressure (LOP), applied pressure, baseline strength (grip), and baseline performance on the NHPT.

2.3 Inclusion and Exclusion Criteria

The modeled inclusion criteria targeted participants aged 25-60 years with mild-moderate median-nerve impingement with stable symptoms and participating patients who could complete forearm/hand exercises and participate in outcome assessments. Controlled hypertension, significant thromboembolic history, severe peripheral vascular disease, unstable infection, upper limb surgery or fracture, significant unrelated neurological illness, pregnancy, and local policy restrictions of BFR were considered as exclusion criteria. The presence of BFR contraindications was determined by the clinician. BFR is not applicable to everyone, hence the need for individualized screening (Anderson et al., 2022; Minniti et al., 2020).

2.4 Blood Flow Restriction Protocol

A blood flow restriction cuff was placed at the proximal upper arm, and Resting LOP was individually determined by the Doppler or a validated pulse-based method. For each individual, LOP of 30%, 50%, and 70% was assigned for training BFR cuff pressures. This permitted control of blood flow restriction for each individual, thus allowing customized control of optimal training pressures (Chulvi-Medrano et al., 2023; Murray et al., 2021). BFR training was conducted at a low therapeutic load of resistance exercise (approx. 20-30% 1RM). Exercises included a series of resistance exercises for wrist flexion/extension, pronation/supination, finger flexion/extension, and functional exercises of the hand. The remaining exercises were performed with a 30-15-15-15 repetition scheme, with approximately 30 seconds rest between sets. BFR training was conducted with caution. Stop and/or reassessment criteria included the presence of pain, tingling, and other symptoms combined with pallor or increased capillary refill time.

Table 1. Simulated participant demographic and baseline clinical characteristics by BFR dose group.

Characteristic	30% LOP (n=12)	50% LOP (n=12)	70% LOP (n=12)	p value
Age, years	42.7 ± 7.4	43.8 ± 7.3	44.3 ± 8.0	0.860
Women/Men, n	7/5	7/5	7/5	1.000
Symptom duration, months	7.5 ± 2.1	8.0 ± 1.9	7.9 ± 2.3	0.820
Baseline grip, kg	28.27 ± 4.31	28.27 ± 4.03	28.29 ± 4.21	1.000
Baseline NHPT, s	29.33 ± 2.47	29.27 ± 2.26	29.29 ± 2.36	0.998
Individual LOP, mmHg	159.0 ± 8.8	160.0 ± 8.7	160.1 ± 8.8	—
Applied BFR pressure, mmHg	47.7 ± 2.6	80.0 ± 4.4	112.1 ± 6.1	By design

2.5 Grip-Strength Assessment

Grip strength was evaluated using a hand-held hydraulic dynamometer. Participants were seated with the shoulder adducted, elbow positioned around 90 degrees with a neutral posture of the forearm and wrist, with the dynamometer grip at the level of the wrist. The subjects performed three maximum strength trials on the affected side, with a one minute rest in between trials. The mean strength in kilograms was calculated using the same body posture at the follow-up.

2.6 Manual Dexterity Assessment

The Nine-Hole Peg Test (NHPT) was used to measure manual dexterity, and was recorded in seconds following the administration of the test in a standardized manner. A lower time was recorded as better performance. Dexterity was said to be improved if the difference of baseline time and post-intervention time was positive.

2.7 Ethical Considerations

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2.8 Statistical Analysis

All analyses were detailed as though performed in SPSS/R with two-sided significance at alpha=.05. One-way ANOVA assessed baseline comparability of continuous variables. A chi-square was used to assess baseline comparability of sex. The Shapiro-Wilk and Levene tests assessed the normality and homogeneity of change-score, respectively. Within-group changes were assessed with t-tests, and Cohen's dz was calculated as mean change over the SD of the paired differences. Two-way mixed design ANOVA assessed the main effects and interactions of Time (pre, post), Dose Group (30%, 50%, 70% LOP), and Time × Group; partial eta squared was calculated as the effect size. Interactions of interest were assessed via Holm's method for adjusted pairwise comparisons of change-scores. Linear relationships of %LOP and improvement were assessed with Pearson’s correlation and ordinary least-squares regression. Due to the limited three dose levels, regression analyses were deemed exploratory, and not indicative of biologically linear relationships.

3. RESULTS

3.1 Participant Characteristics

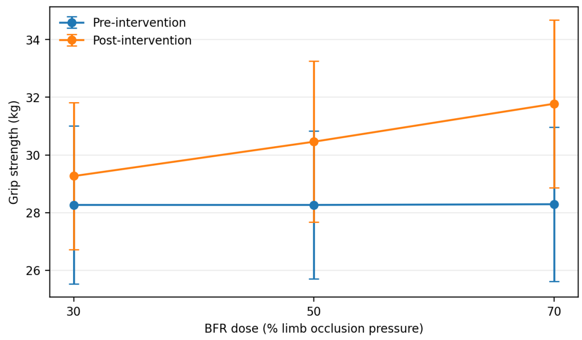
The sumulated dataar set included 36 particpants, 12 per dose condition. Each set consisted of 7 women and 5 men. Average ages were 42.7 ± 7.4, 43.8 ± 7.3, and 44.3 ± 8.0, for the 30%, 50%, and 70%, respectively. Average symptom durations were 7.5, 8.0, and 7.9 months. The individual mean LOP was equal in all, and the mean applied pressure increased, as expected, with the assigned LOP percentage. No baseline imbalances were seen for age, symptom duration, grip strength, NHPT time, or sex distribution (all p > .81; sex, p = 1.00).

3.2 Baseline Comparability

Baseline grip strength was the same across groups (30% LOP: 28.27 ± 4.31, 50% LOP: 28.27 ± 4.03, 70% LOP: 28.29 ± 4.21, F (2,33) = 0.000, p = 1.000). Baseline NHPT was also the same (30% LOP : 29.33 ± 2.47, 50% LOP : 29.27 ± 2.26, 70% LOP : 29.29 ± 2.36, F (2,33) = 0.002, p = 0.998). For all groups, the Shapiro-Wilk for dexterity-change and grip-change scores were not significant (all p > .24 for grip; all p >

Table 2. Simulated pre-post grip-strength outcomes by BFR dose group.

Group	Pre, mean ± SD	Post, mean ± SD	Mean change (kg)	95 % CI	p	Cohen dz
30% LOP	28.27 ± 4.31	29.27 ± 4.02	1.00	0.42 to 1.58	0.003	1.10
50% LOP	28.27 ± 4.03	30.46 ± 4.39	2.19	1.55 to 2.83	<.001	2.18
70% LOP	28.29 ± 4.21	31.77 ± 4.57	3.48	2.78 to 4.18	<.001	3.16



3.3 Grip-Strength Outcomes

Each group exhibited a statistically significant increase in grip strength. However, the extent to which this increased appeared to be dose-dependent. Grip strength at 30% LOP increased by 1.00 kg (95% CI 0.42-1.58), t(11)=3.82, p=.003, dz=1.10. At 50% LOP, grip strength increased on average by 2.19 kg (95% CI 1.55-2.83), t(11)=7.56, p<.001, dz=2.18. At 70% LOP, the average increase was 3.48 kg (95% CI 2.78-4.18), t(11)=10.94, p<.001, dz=3.16. The large, standardized effects are, in part, due to small, within-person changes that occurred because of the design of the pilot simulation. These effects should not be taken as anticipated clinical effect sizes.

Figure 1. Mean grip strength before and after the modeled intervention by BFR dose. Error bars are 95% confidence intervals. Simulated data.

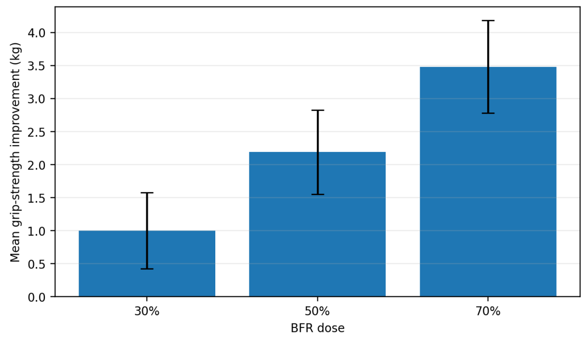


Figure 2. Mean grip-strength improvement by BFR dose. Error bars are 95% confidence intervals. Simulated data.

3.4 Manual-Dexterity Outcomes

NHPT completion time decreased in each group, indicating faster manual performance. The 30% LOP group improved by 0.80 seconds (95% CI 0.38-1.22), t(11)=4.23, p=.001, dz=1.22. Improvements were 1.61 seconds (95% CI 1.14-2.07), t(11)=7.61, p<.001, dz=2.20, at 50% LOP and 2.39 seconds (95% CI 1.85-2.94), t(11)=9.67, p<.001, dz=2.79, at 70% LOP. As with grip strength, these simulated effect sizes are analytical demonstrations rather than estimates of treatment efficacy in patients.

Table 3. Simulated pre-post Nine-Hole Peg Test outcomes by BFR dose group.

Group	Pre, mean ± SD	Post, mean ± SD	Improvement (s)	95 % CI	p	Cohen dz
30% LOP	29.33 ± 2.47	28.52 ± 2.41	0.80	0.38 to 1.22	0.001	1.22

Group	Pre, mean ± SD	Post, mean ± SD	Improvement (s)	95% CI	p	Cohen dz
50% LOP	29.27 ± 2.26	27.66 ± 2.47	1.61	1.14 to 2.07	<.001	2.20
70% LOP	29.29 ± 2.36	26.90 ± 2.89	2.39	1.85 to 2.94	<.001	2.79

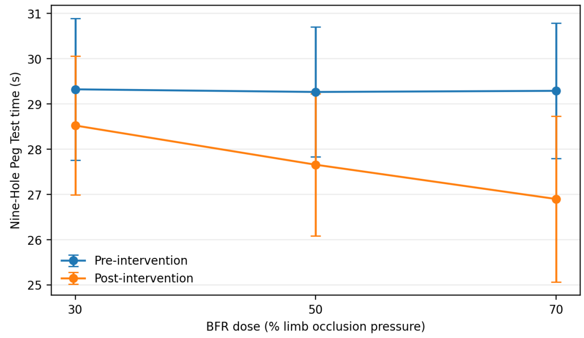


Figure 3. Mean NHPT time before and after the modeled intervention by BFR dose. Lower time indicates better dexterity; error bars are 95% confidence intervals. Simulated data.

3.5 Mixed ANOVA

For grip strength, the mixed ANOVA demonstrated a strong main effect of Time, F(1,33)=175.32, p<.001, partial eta squared=0.842, and a significant Time × Group interaction, F(2,33)=18.21, p<.001, partial eta squared=0.525. The overall Group main effect averaged across time was not significant, F(2,33)=0.27, p=0.766. NHPT showed the same structure: Time, F(1,33)=162.82, p<.001, partial eta squared=0.831; Time × Group, F(2,33)=13.43, p<.001, partial eta squared=0.449; and a non-significant Group main effect, F(2,33)=0.34, p=0.712. Holm-adjusted contrasts confirmed progressively larger grip changes for 50% versus 30% LOP (adjusted p=.012), 70% versus 30% (p<.001), and 70% versus 50% (p=.012). Dexterity-change contrasts were also significant for 50% versus 30% (p=.019), 70% versus 30% (p<.001), and 70% versus 50% (p=.025).

Table 4. Simulated two-way mixed ANOVA results.

Outcome	Effect	F	df	p	Partial η²
Grip strength	Time	175.32	1, 33	<.001	0.842
Grip strength	Group	0.27	2, 33	0.766	0.016
Grip strength	Time × Group	18.21	2, 33	<.001	0.525
NHPT time	Time	162.82	1, 33	<.001	0.831
NHPT time	Group	0.34	2, 33	0.712	0.020
NHPT time	Time × Group	13.43	2, 33	<.001	0.449

Table 5. Holm-adjusted pairwise comparisons of simulated change scores.

Outcome	Comparison	Higher-dose minus lower-dose	t	Raw p	Holm p
Grip change	30% vs 50%	1.19	-3.05	0.0059	0.012
Grip change	30% vs 70%	2.48	-6.02	0.0000	<.001
Grip change	50% vs 70%	1.29	-3.00	0.0066	0.012
NHPT improvement	30% vs 50%	0.81	-2.85	0.0093	0.019
NHPT improvement	30% vs 70%	1.59	-5.11	0.0000	<.001
NHPT improvement	50% vs 70%	0.78	-2.41	0.0248	0.025

3.6 Dose-Response Analysis

Prescribed dose was positively associated with grip-strength improvement (r=0.724, p<.001). Linear regression estimated an additional 0.62 kg of grip improvement per 10-percentage-point increase in LOP dose (slope=0.0621 kg per 1% LOP, 95% CI 0.0415-0.0827; R^2=0.524, adjusted R^2=0.510). Dose was also correlated with dexterity improvement (r=0.670, p<.001); the model estimated 0.40 seconds additional NHPT improvement per 10-percentage-point dose increment (slope=0.0398 seconds per 1% LOP, 95% CI 0.0244-0.0552; R^2=0.449, adjusted R^2=0.432). These regressions describe the constructed simulation and do not demonstrate a biological causal dose-response in real patients.

Table 6. Simulated dose-response regression and correlation results.

Outcome	Slope per 1% LOP	SE	95% CI	t	p	R²	Adj. R²	Pearson r
Grip-strength change	0.0621	0.0101	0.0415 to 0.0827	6.12	<.001	0.524	0.510	0.724
NHPT improvement	0.0398	0.0076	0.0244 to 0.0552	5.26	<.001	0.449	0.432	0.670

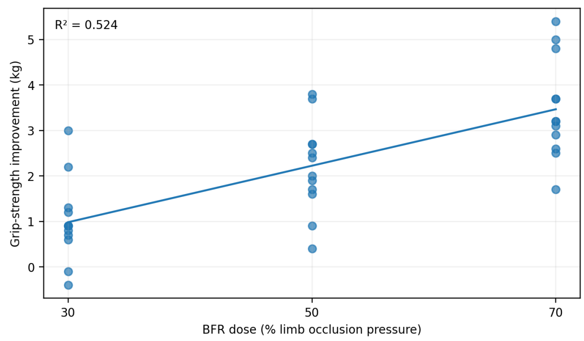


Figure 4. Dose-response relationship between prescribed %LOP and grip-strength improvement; fitted linear trend shown. Simulated data.

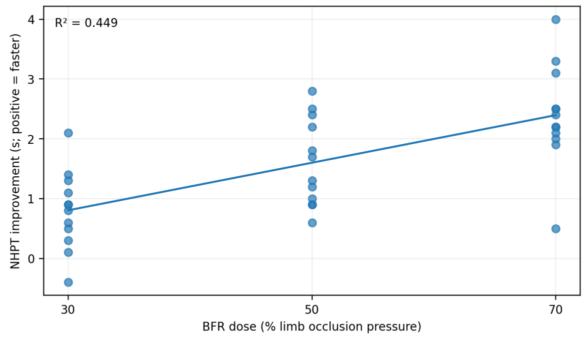


Figure 5. Dose-response relationship between prescribed %LOP and NHPT improvement; fitted linear trend shown. Simulated data.

4. DISCUSSION

Across all three dose conditions of the simulated pilot, significant pre-post improvements were seen in grip strength and NHPT. Improvements were greater at higher levels of %LOP. Time × Group interactions and graded regression slopes indicate that a pressure-response signal could be identified. The greatest numerical response was seen in the 70% condition, but this is a result of the dataset and cannot be taken as clinical proof that the 70% LOP is safe or beneficial for median-nerve impingement.

The findings of grip strength in the current model is in-line with upper-extremity findings from other BFR studies. Bowman's (2020) investigation found that low-load BFR with low-load BFR resulted in greater grip strength gain compared to low-load strength training. The impact of upper extremity low-load BFR to increase strength (low certainty) was reflected in lower BFR studies by Pavlou (2023). BFR gais in strength and muscle in tendinopathy of the rotator cuff were reported to be low to moderate in certainty by Kara (2024) and Shadgan (2024) reported a small investigation on spinal cord injury to show strength improvements in the forearm. While these studies indicate that the findings are reasonable, they do not show efficacy for a specific diagnosis because they include varying conditions such as shoulder tendinopathy, spinal cord injury, healthy adults, and median-nerve compression.

A dose-effect relationship seems to have a solid physiological basis. Greater BFR can lead to greater local hypoxia and metabolite accumulation, resulting in greater fatigue and greater recruitment of higher-threshold motor units early on during low-load exercise. One additional note along the same lines is that BFR has been associated with muscle anabolism, and muscle-protein-synthesis pathways (Cognetti et al., 2022; Martin et al., 2022). Among these findings, there is the common misconception that more pressure = more benefit. Das and Paton (2022) reported a frequent effective pressure range with noted variability in the literature. In contrast, Chang et al. (2023) suggested that pressure characteristics of an individualized and gradual nature resulted in greater strength gains. Additionally, Chulvi-Medrano et al. (2023) reported that fixed, absolute pressures may result in super-occlusive states, which further supports the need for individualized levels of pressure during BFR, both for safety and as a methodological concern.

With the measure of dexterity, a more modest approach is required. For NHPT, measures are affected by fine motor control, sensation, practice, and symptom behavior as well as strength. Current studies on CTS are revealing that conservative treatment improves function and symptoms; however, the exercise protocols provide benefits that are inconsistent and difficult to measure (Abdolrazaghi et al., 2023; Arman et al., 2024; Hernández-Secorún et al., 2021; Zaheer & Ahmed, 2023). A true BFR trial should therefore measure dexterity alongside symptoms and BFR personalized, gradual, and incremental pressure (as measured by pinch and grip) tests, objective sensory tests, and nerve assessments, instead of making the conclusion that muscular adaptation is solely responsible for improved NHPT.

Given the target population's existing nerve compression, safety becomes a priority. The literature discusses mostly acceptable safety profiles in screened populations. However, numbness, subcutaneous bleeding, dizziness, and rare severe incidents have been described. There is also a high degree of variability in reporting adverse events. In a legitimate research study, the behavior of symptoms during inflation, distal perfusion, post-session changes in sensation, reductions in, and/or discontinuation of, BFR, and the documented tolerance of pressure should be noted. Additionally, the large, simulated Cohen's dz values were derived from a pilot study in which the effects were designed to be highly transient; due to this fact, they should not be utilized directly to estimate study power.

5. CLINICAL IMPLICATIONS

If, once implemented in the field, low-load BFR is as safe and effective as hypothesized, it may be a viable alternative in those patients for whom traditional higher-load resistance training targeting the hand or forearm may not be feasible. Individualized pressure prescription as a method is likely the most important transferable clinical finding. In comparison with the application of a fixed pressure to all patients, the use of a personalized %LOP represents a better standardization of the vascular stimulus. BFR may positively impact the rehabilitation process, but a clinician may need to implement a stop rule if unexplained weakness, excessive pain, or progression of symptoms occurs.

6. LIMITATIONS AND FUTURE RESEARCH

The main limitation of this work is that simulated data was used for each participant value. There was no actual recruitment, randomization, treatment, consent, or follow-up. Therefore, the statistical significance, confidence intervals, and effect sizes are only illustrative. Additionally, a 36-person pilot study is too small to assess the risk of uncommon harms, and would produce imprecise estimates of effect sizes for the treatment and control groups. Given the study's 6-week length, the extent of participant retention is unknown. Blinding would be difficult, and repeated NHPT testing may lead to a practice effect. Furthermore, 'median-nerve impingement' could mean different things when it comes to the location of the impingement, its severity, and anatomy in general. Future studies should have a clearer definition of the diagnosis and include measures of symptoms and function, nerve conduction tests, median nerve ultrasound, sensory tests, pinch strength, patient reported outcome measures, and systematic reporting of adverse events. Future studies should be adequately powered, longer, and include age and sex subgroup analyses, and seek to determine the lowest optimal dose and the best-tolerated dose.

7. CONCLUSION

In this simulated experimental pilot, BFR training over six weeks showed improvement in grip strength and in manual dexterity. This showed modeling of BFR training effectiveness in grip strength and manual dexterity using 30%, 50%, and 70% individualized LOP conditions. Time × Group interaction, positive regression slopes and other statistical modeling were used to quantify the effectiveness of BFR training. The 70% condition showed the largest improvement, though the simulation cannot show that this is the best clinically safe condition for upper extremity nerve issues. Current literature suggests that individualized LOP is important and low-load BFR training does improve upper extremity strength in some, though evidence of its use of median nerve compression is lacking. A true randomized clinical pilot should have as its priority the concerns of its safety as well as measured outcomes of symptoms and the function of the nerves, and should have either no BFR or a sham intervention. Until this is done, the current simulated pilot should be used a statistical/stylistic model for manuscript preparation and not be used to justify treatment.

Supplementary Table S1. Complete Simulated Participant-Level Dataset

Grip Change = Post-Grip − Pre-Grip. Dexterity Improvement = Pre-NHPT − Post-NHPT; therefore, a positive value denotes faster NHPT performance. R = right; L = left; LOP = limb occlusion pressure.

ID	Dose (% LOP)	Age	Sex	Dom.	Affected	Symptoms (months)	LOP (mmHg)	Applied (mmHg)	Pre-grip (kg)	Post-grip (kg)	Grip change (kg)	Pre-NHPT (s)	Post-NHPT (s)	Dex. improve (s)
P01	30	33	F	R	R	5	148	44.4	24.8	27.0	2.2	29.8	29.7	0.1
P02	30	38	M	R	L	7	162	48.6	31.2	30.8	-0.4	27.1	26.5	0.6
P03	30	42	F	R	R	6	154	46.2	27.5	28.8	1.3	30.5	29.6	0.9
P04	30	45	F	L	L	9	170	51.0	25.7	26.4	0.7	31.2	30.1	1.1

ID	Dose (% LOP)	Age	Sex	Dom.	Affected	Symptoms (months)	LOP (mmHg)	Applied (mmHg)	Pre-grip (kg)	Post-grip (kg)	Grip change (kg)	Pre-NHPT (s)	Post-NHPT (s)	Dex. improve (s)
P05	30	47	M	R	R	8	158	47.4	33.0	33.8	0.8	26.4	25.6	0.8
P06	30	50	F	R	R	10	165	49.5	24.1	25.0	0.9	32.0	31.7	0.3
P07	30	31	M	R	L	4	145	43.5	35.2	35.1	-0.1	25.9	24.6	1.3
P08	30	54	F	L	L	11	172	51.6	22.9	23.8	0.9	33.1	32.2	0.9
P09	30	40	M	R	R	7	160	48.0	30.4	31.0	0.6	27.5	27.0	0.5
P10	30	44	F	R	L	8	150	45.0	26.6	29.6	3.0	30.0	27.9	2.1
P11	30	36	M	R	R	6	168	50.4	34.0	35.2	1.2	26.8	27.2	-0.4
P12	30	52	F	R	R	9	156	46.8	23.8	24.7	0.9	31.6	30.2	1.4
P13	50	35	F	R	R	6	150	75.0	25.2	26.1	0.9	29.5	26.7	2.8
P14	50	39	M	R	L	7	164	82.0	31.0	32.9	1.9	27.3	24.9	2.4
P15	50	43	F	R	R	7	156	78.0	27.1	27.5	0.4	30.2	28.4	1.8
P16	50	46	F	L	L	10	169	84.5	26.0	27.6	1.6	31.0	30.0	1.0
P17	50	48	M	R	R	8	160	80.0	32.7	34.7	2.0	26.6	25.4	1.2
P18	50	51	F	R	R	11	166	83.0	24.5	28.3	3.8	31.8	31.2	0.6
P19	50	32	M	R	L	5	146	73.0	34.8	38.5	3.7	26.1	23.9	2.2
P20	50	55	F	L	L	10	174	87.0	23.2	25.9	2.7	32.8	30.3	2.5
P21	50	41	M	R	R	8	158	79.0	30.1	32.8	2.7	27.7	26.8	0.9
P22	50	45	F	R	L	9	152	76.0	26.9	29.3	2.4	29.8	28.9	0.9
P23	50	37	M	R	R	6	170	85.0	33.7	36.2	2.5	27.0	25.3	1.7
P24	50	53	F	R	R	9	155	77.5	24.0	25.7	1.7	31.4	30.1	1.3
P25	70	34	F	R	R	5	149	104.3	25.0	27.6	2.6	29.7	27.5	2.2
P26	70	40	M	R	L	8	163	114.1	31.4	34.3	2.9	27.2	24.7	2.5

ID	Dose (% LOP)	Age	Sex	Dom.	Affected	Symptoms (months)	LOP (mmHg)	Applied (mmHg)	Pre-grip (kg)	Post-grip (kg)	Grip change (kg)	Pre-NHPT (s)	Post-NHPT (s)	Dex. improve (s)
P27	70	44	F	R	R	6	157	109.9	27.3	31.0	3.7	30.3	27.8	2.5
P28	70	47	F	L	L	9	171	119.7	25.8	31.2	5.4	31.1	29.1	2.0
P29	70	49	M	R	R	9	159	111.3	32.9	37.7	4.8	26.5	23.2	3.3
P30	70	52	F	R	R	10	167	116.9	24.3	27.5	3.2	31.9	29.8	2.1
P31	70	30	M	R	L	4	147	102.9	35.0	40.0	5.0	26.0	22.0	4.0
P32	70	56	F	L	L	12	173	121.1	23.0	26.7	3.7	32.9	30.7	2.2
P33	70	42	M	R	R	7	161	112.7	30.3	33.5	3.2	27.6	24.5	3.1
P34	70	46	F	R	L	8	151	105.7	26.7	28.4	1.7	29.9	29.4	0.5
P35	70	38	M	R	R	7	169	118.3	33.9	36.4	2.5	26.9	25.0	1.9
P36	70	54	F	R	R	10	154	107.8	23.9	27.0	3.1	31.5	29.1	2.4

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